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Mealworms

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UNITED STATES DEPARTMENT OF AGRICULTURE

MEALWORMS

Of the many insects found in stored grain and in milled cereal products, the mealworms are the most easily recognized. They resemble wireworms and when full grown are about an inch long. They are found in all parts of the world and have long been familiar to both scientists and laymen because of their usefulness as food for birds, reptiles, fish, and small mammals, as well as for their habit of breeding in grain and milled cereals.

Two species of mealworms are common in this country, the yellow mealworm and the dark mealworm. The scientific names of these mealworms are *Tenebrio molitor* and *obscurus*. Both species are probably of European or Asiatic origin.

Habits

The mealworms are primarily scavengers and prefer to feed on decaying grain or milled cereals that are damp and in poor condition. However, they will devour meal, flour, bran, grain, coarse cereals, bread, crackers, mill sweepings, meat scrap, feathers, the bodies of dead insects, and similar materials.

The two species are frequently found together. They usually live in dark, damp places, such as in accumulations of grain in neglected corners of mills, under bags of feed in warehouses and feed stores, in bins containing damp grain, or in the litter of chicken houses and bird houses where feathers and refuse grain are mixed with excrement.

When full grown, mealworms wander about, probably in search of a place to pupate and transform into beetles. Large numbers frequently wander into strange places and cause more trouble by their mere presence than by the actual damage they do in feeding. They have been found in bags of fertilizer and of salt, boxes of soda ash, bales of tobacco, and in ground black pepper.

Several years ago a warehouse containing bagged feed was invaded by thousands of mealworms. They crawled into the ears of the feed bags, although they did not attack the feed. The presence of so many worms ruined the sale of the feed, as the prospective buyer, catching hold of a bag of feed by the ears, would be startled to find himself clutching a handful of worms. Investigation showed that they were breeding under the warehouse in meal and cereal dust that had sifted through the floor. After becoming full grown, they had crawled up the walls of the building and through cracks between the walls and the timbers of the floor.

Life History

Mealworms normally pass the winter in the worm, or larval, stage. The adults emerge in the spring and early summer, live 2 to 3 months, and die.

The eggs are white and about one-twentieth inch long. They are laid singly or in small clusters, in the material in which the insects are living. When first laid, they are covered with a sticky secretion that causes them to become quickly coated with particles of the foodstuff. The eggs hatch after 4 days to a week at normal spring or summer temperatures, or longer at lower temperatures.

The larvae of the dark mealworm may become full grown in about 3 months, but the yellow mealworm requires at least 9 months; and under unfavorable conditions 2 years may be required for them to complete development. The larvae molt, or cast their skins, many times in the course of their lives. After becoming full grown the larvae may change to the pupal form or may remain for many months with little change in size or outward appearance. In heated buildings the larvae of the dark mealworm begin to pupate in November, but larvae of the yellow mealworm

have not been observed to pupate before January. In unheated situations pupation does not occur until spring or early in the summer.

The pupae of both species are one-half to three-fourths inch long. When first formed they are white, but gradually change to a yellowish brown. The pupal period lasts about 20 days in January and February, but only about 7 days in June. When pupation is complete the pupal skin is cast off, and the adult appears.

The adult beetles of the two species look much alike but are readily distinguishable. The adult of the yellow mealworm is shining brown to almost black, whereas that of the dark mealworm is a dull pitchy black. The beetles of both species are a little less than an inch long. They appear in numbers in the spring, but in heated buildings an occasional beetle may be seen in almost any month of the year. They do not live so long as some of the other pests of stored grain, the average longevity being about 2 months for the yellow mealworm and 3 months for the dark mealworm. The beetles are prolific egg layers. Females of the yellow mealworm lay about 275 eggs each, and those of the dark mealworm about 475.

Directions for Rearing Mealworms

Use of mealworms for fish bait or as food for birds and small mammals has created a demand for information on methods of rearing them. With proper precautions mealworms can be reared with little effort and attention.

A wooden box or flat 8 or 10 inches deep, 2 feet long, and 18 inches wide makes a satisfactory rearing container. A suitable lid can be made. Perforating a thin sheet of zinc cut to fit inside the rim of the box and rest on a narrow wooden strip all around makes a suitable lid. This cover can be removed easily and will allow good ventilation.

Fill the box to within about 2 inches of the top with wheat bran containing a little graham flour and commercial meat scrap. Since the worms like moist foodstuffs, add

from time to time raw fresh vegetables such as carrots, potatoes, or lettuce. Do not mix these vegetables with the bran but place them on a thin piece of board or metal laid on top of the bran. This tray can be removed for cleaning. Take care to keep the bran from becoming so moist that molds or mites may develop and ruin the culture. Add fresh bran as needed.

Start the culture by introducing from 500 to 1,000 larvae or beetles, whichever can be obtained. The demand will indicate how many boxes of fresh cultures to start each spring.

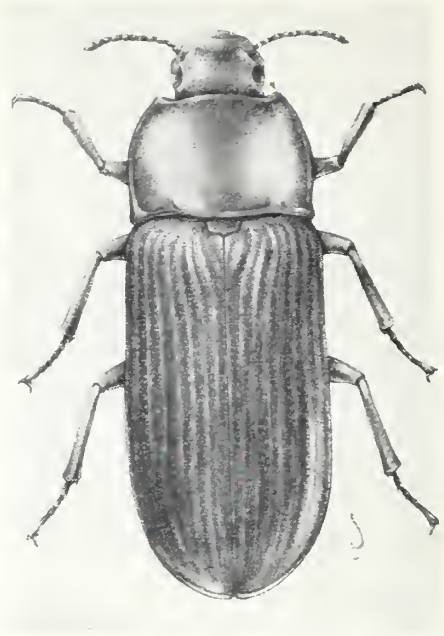
If it is desirable to obtain a supply of adult beetles in the fall, the usual hibernation period of the dark mealworm can be prevented by exposing the full-grown larvae to continuous light. Many of them will pupate and transform to beetles in a few weeks.

Control Measures

Prevent mealworm infestations by periodically cleaning up accumulations of grain, meal, flour, sweepings, and refuse in mills, warehouses, granaries, and elevators, or under loading docks or warehouse floors through which such products sift.

Use of insecticidal sprays for the treatment of wooden floors or walls of empty granaries or warehouses also helps prevent the establishment of mealworm infestations. Sprays that have been found satisfactory for this purpose are emulsions and suspensions containing 3 percent of malathion (premium grade only), 2.5 percent of methoxychlor, or 0.5 percent of pyrethrum or allethrin alone or with a suitable synergist. Dosages of 1 to 2 gallons per 1,000 square feet of surface are recommended, depending on the condition of the woodwork and the amount of fluid required to saturate it to the point of runoff.

For the treatment of stored grain that has become infested with mealworms, nothing is better than fumigation. For information on fumigation procedures consult your county agent or State agricultural experiment station or the United States Department of Agriculture.



Dark mealworm beetle.

Prepared by the
Stored-Product Insects Branch,
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The earliest edition of this leaflet, issued in 1940, was prepared by R. T. Cotton, Bureau of Entomology and Plant Quarantine.

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